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<p>(54) Title: EXTERNAL CACHE FOR ON-LINE RESOURCES</p> <p>(57) Abstract</p> <p>An external cache (20) for use with a computer network (10) communicates with a client node (18) of the network (10). The external cache (20) contains a number of cached files associated with a network resource (30) such as a Web page. Network files (28) corresponding to the cached files are maintained at a server node (12) of the network (10) and may be downloaded to the client node (18) according to conventional techniques. In response to an end-user request for the network resource (28), the computer network (10) searches the server node (12) and the external cache (20) for the associated network (28) and cached files. Date/time stamps attached to the network (28) and cached files are processed to determine the most current files associated with the requested network resource (30). The client node (18) retrieves cached files, when such files are current and available, to reduce the access/download time associated with the network resource (30).</p>			

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EXTERNAL CACHE FOR ON-LINE RESOURCES

FIELD OF THE INVENTION

The present invention relates generally to on-line computer network systems. More particularly, the present invention relates to an external cache that provides client node access to on-line resources traditionally accessible only from the network 5 server node.

BACKGROUND OF THE INVENTION

Interest in on-line computer services, the Internet, and the World Wide Web (WWW) has increased dramatically in recent years. Individual end-users, small businesses, and large corporations develop Web pages for entertainment, marketing 10 and sales, advertising, and other purposes. Web pages and other on-line computer resources are often "dynamic" because they provide new or updated information to multiple end-users on a periodic basis. In contrast, "static" information sources, such as CD-ROMs, are configured to provide a specific amount of information to a relatively limited number of end-users.

15 Due to the practical limitations of modems and other data transmission devices, the download time associated with Web pages and other on-line resources can be undesirably long. The download time noticeably increases when the desired content includes relatively large data files, e.g., video, graphic, or audio files. Excessive downloading time detracts from the convenience and enjoyment otherwise associated 20 with use of the Internet and other interactive on-line services. Accordingly, some Internet information providers have chosen to develop "fast-downloading" Web pages having a relatively small amount of complex graphic, video, and/or audio data. While this design methodology may improve the access speed associated with a Web page, it fails to take full advantage of the processing capability of client nodes. For 25 example, a CD-ROM resident at a client node can provide enhanced Web page

features if properly configured to cooperate with an appropriate Web browsing program.

Many Web pages are designed for marketing and advertising purposes; marketing representatives of a company may direct a potential customer or client to 5 the company's Web page for background or preliminary information. Unfortunately, this marketing strategy assumes that the potential customer or client has ready access to the Internet or the WWW. Accordingly, the technological resources available to the customer may limit the practical application of such a marketing strategy. Furthermore, it may be desirable to have a limited Web page available to 10 all on-line subscribers and a more extensive presentation available for use by individual consumers at their particular client nodes.

External caches may be employed at client nodes in an attempt to address the above shortcomings related to the downloading and presentation of on-line information and resources. Unfortunately, such external caches have typically been 15 incompatible with the functionality of "network browser" or similar programs, which provide an interface between the computer network and end-users located at client nodes.

SUMMARY OF THE INVENTION

Accordingly, it is an advantage of the present invention that an improved 20 external cache for use with an on-line computer network is provided.

Another advantage is that the present invention enables quick access to on-line resources, such as Web pages, via an external cache located at a client node of a computer network.

A further advantage is that relatively "dynamic" Web page content, which is 25 susceptible to periodic updating at a server node of the computer network, can be combined with relatively "static" Web page content stored in an external cache located at a client node of the computer network.

Another advantage of the present invention is that an external cache having Web page content may be embodied in a portable storage medium such that the Web page content may be presented to an end-user without establishing a connection to the Internet or the WWW.

5 A further advantage is that Web page content can be stored in an external cache that is fully compatible with conventional "network browser" programs.

These and other advantages of the present invention may be carried out in one form by a computer system for managing and allocating network resources. Such a computer system may include a client node configured to communicate with a server 10 node of a computer network, a network browser program residing at the client node, an external cache in data communication with the client node, and a computer readable program segment residing at the client node. The external cache contains a cached file associated with a network resource, such as a Web page, and the program segment is configured to indicate a location of the external cache to the 15 network browser program.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete understanding of the present invention may be derived by referring to the detailed description and claims when considered in connection with the Figures, wherein like reference numbers refer to similar items throughout the 20 Figures, and:

FIG. 1 is a schematic representation of an exemplary computer network configured in accordance with the present invention;

FIG. 2 is a schematic representation of the contents of an exemplary external cache employed by the computer network;

25 FIG. 3 is a flow diagram of a network resource caching process;

FIG. 4 is a flow diagram of a network resource management process; and

FIG. 5 is a flow diagram of a network resource selection process.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, an exemplary computer network 10 configured in accordance with the present invention is illustrated. In accordance with the preferred embodiment, computer network 10 provides end-users with access to on-line network resources via, e.g., the Internet. Such network resources may be accessed, processed, and manipulated by computer network 10 in response to end-user interaction with computer network 10. For purposes of this specification, "network resources" generally refers to data, information, electronic documents, Web pages, and the like, all of which may be remotely accessible to end-users of computer network 10. It should be appreciated that the specific configuration depicted in FIG. 1 is merely exemplary, and that the present invention may be implemented with any number of different network architectures.

Computer network 10 generally includes any number of server nodes configured to communicate with any number of local computer systems. For the sake of clarity, only one server node 12 and one local computer system 14 are illustrated in FIG. 1. However, those skilled in the art will appreciate that server node 12 may communicate with and support any number of additional server nodes and/or local computer systems as necessary for the specific application.

The various elements of computer network 10 may be interconnected via an associated number of data communication channels or links 16. Preferably, data communication link 16 facilitates substantially real time interaction between local computer system 14 and server node 12. Data communication link 16 may employ conventional wired or wireless modem technology, high speed data transmission protocols, fiber optic technology, or any number of suitable data transmission methodologies.

For purposes of this description, computer system 14 may be configured as an individual personal computer, a LAN, a WAN, or any suitable computing architecture having a sufficient amount of processing power and memory capacity to manage and

allocate network resources in accordance with the present invention. Computer system 14 preferably includes a client node 18, configured to communicate with server node 12, and an external cache 20 in data communication with client node 18. External cache 20 may either be integral to client node 18 or, preferably, embodied

5 in a computer program product 21 (described below) that is compatible with client node 18. It should be appreciated that client node 18 may function as a local server in the context of a LAN or a WAN arrangement. Computer system 14 may additionally include any number of conventional peripheral devices known to those skilled in the art, e.g., a display unit 22, a user interface 24, or the like.

10 Client node 18 preferably includes conventional memory elements (not shown) having sufficient memory capacity to store data and program code utilized by the present invention. In addition, client node 18 preferably includes conventional processing components (not shown) having sufficient processing power to manipulate data and otherwise carry out the various processes described below.

15 To facilitate compatible interaction with a number of on-line network resource providers, a suitably configured network browser program 26 resides and operates at client node 18. Those skilled in the art will recognize that network browser program 26 enables an end-user located at client node 18 to access, view, and interact with any number of Web pages or other network resources that may be

20 available on the Internet. In the preferred embodiment, network browser program 26 utilizes the commercially available Netscape® Navigator® program (version 3.0). Of course, the present invention may employ any suitable network browser program 26.

Server node 12 is suitably configured to provide access to a plurality of network files 28. Network files 28 may be associated with a network version of a

25 network resource 30, e.g., a particular Web page available on the World Wide Web (WWW). Although a Web page is typically identified as a single hypertext document, the document may actually include or access any number of distinctly-named network files 28. For example, a given Web page may be associated with any number of

audio-visual files (.avi files), graphics files (.gif files), and/or hypertext files (.htm files).

As depicted in FIG. 1, a first network resource 30a may be defined by any number of associated network files 28a. Similarly, a second network resource 30b 5 may also include any number of associated network files 28b. Although, for practical reasons, each network resource 30 typically includes more than one associated network file 28, such is not a restriction on the present invention. Furthermore, those skilled in the art will recognize that any number of network resources 30 may be accessed and processed by server node 12.

10 Server node 12 is configured to provide a specific network resource 30 to client node 18 in response to a request originating from client node 18. The particular network resource 30 may be maintained at server node 12 or it may be maintained at a remote server and made available to server node 12 via computer network 10.

According to a preferred aspect of the present invention, each network file 28 15 processed by server node 12 includes an associated date/time stamp 32. Date/time stamps 32 may be desirable to facilitate monitoring and updating of network files 28. For example, content providers update information on their Web pages frequently to provide current and accurate data to interested end-users. In addition, date/time stamps 32 are preferably processed by computer system 14 to automatically select 20 the newest files associated with a requested network resource 30.

As described above, client node 18 communicates with an external cache 20, which may be integral to client node 18 (e.g., embodied in a hard disk memory element) or remote from client node 18 (e.g., embodied in a physically distinct server that communicates with client node 18). Preferably, external cache 20 is embodied 25 in a portable data storage device, such as computer program product 21. Computer program product 21 may be realized as a digital recording disc (e.g., a CD-ROM), a magnetic recording disc (e.g., a floppy disc), or the like. Computer program product 21 includes a storage medium that stores computer readable program code and computer readable data in a conventional manner. For purposes of this description,

"program code" refers to processing instructions written in a specific syntax as necessary for the particular application.

Generally, and as described in more detail below, external cache 20 enables client node 18 to access a cached version of a selected network resource 30 in lieu of a downloaded network version of the selected network resource 30. The ability to access a cached version of network resource 30 greatly reduces the downloading time typically associated with interactive use of computer network 10. In practice, the network version of a network resource 30 may contain recent revisions or updated content not included in the current cached version of the same network resource 30. Alternatively, the different versions of the network resource may contain a varied amount of informative content. For example, the network version may be associated with a restricted or limited Web page having a relatively low content while the cached version may be associated with a fully operational Web page having enhanced sound, graphics, or video.

Referring to FIG. 2, the contents of an exemplary external cache 20 are schematically illustrated. External cache 20 preferably contains a plurality of cached files 34, a file directory 36, and a computer readable program segment 38. External cache 20 and program segment 38 are preferably embodied in a single storage medium such as computer program product 21. Alternatively, program segment 38 may reside independently at client node 18 and functionally cooperate with external cache 20 and/or network browser program 26.

External cache 20 is configured to provide cached files 34 to network browser program 26 for processing at client node 18. For a given cached version of a network resource 30, external cache 20 may contain any number of associated cached files 34. As described above in connection with network files 28, cached files 34 may include audio-visual files, graphics files, and/or hypertext files associated with Web page content. To facilitate updating and file selection by computer system 14, a specific cached file 34 and a corresponding network file 28 may be designated within computer network 10 with the same file name and extension.

According to the preferred embodiment, each cached file 34 includes a date/time stamp 40 that indicates when the associated cached file 34 was transferred to or created in external cache 20. As described above in connection with date/time stamps 32, date/time stamps 40 may be employed by computer system 14 during 5 file maintenance, content updating, or file selection processes. The processing of date/time stamps 32 and 40 is described below in connection with the selection of network files 28 and cached files 34 (see FIG. 5).

External cache 20 preferably includes file directory 36, which may be configured to direct network browser program 26 to select a number of cached files 10 34 in response to a request for a particular network resource 30. In other words, file directory 36 preferably functions as an interface between network browser program 26 and cached files 34 stored in external cache 20. File directory 36 may be configured as a file allocation table, a file manager program, or any suitable data base management architecture.

15 As described above, external cache 20 also includes program segment 38. In the preferred embodiment, program segment 38 is compatible with Hypertext Markup Language (HTML). Those skilled in the art will recognize that HTML refers to a standardized hypertext language used to create Web pages and other hypertext documents. The present invention may utilize alternative programming languages as 20 necessary for compatibility with the specific network browser program 26, and/or the particular operating protocols utilized by computer network 10.

Program segment 38 is preferably configured to indicate a location of external cache 20 to network browser program 26 during operation of computer system 14. Program segment 38 may also be configured to cause network browser program 26 25 to access cached files 34 in response to requests for network resources 30. In the preferred embodiment, which utilizes Netscape® Navigator® for network browser program 26, program segment 38 includes at least the following HTML code: META HTTP-EQUIV = "Ext-cache". For compatibility with Netscape® Navigator®, program

segment 38 is maintained at client node 18 under a suitable file name having an "htm" extension.

Briefly, in response to an end-user request for a specific network resource 30, program segment 38 instructs network browser program 26 to search external cache 5 20 for files related to the requested network resource 30. If corresponding network files 28 also exist for the requested network resource 30, then computer system 14 compares the date/time stamp 32 associated with each network file 28 with the date/time stamp 40 associated with each corresponding cached file 34. Consequently, network files 28 associated with the requested network resource 30 10 are downloaded from server node 12 only when the corresponding cached files 34 are outdated or when no corresponding cached files 34 exist.

Referring now to FIG. 3, a flow diagram of a network resource caching process 42 is illustrated. Process 42 can be performed by computer system 14 to capture and store network resources 30 for subsequent retrieval at client node 18.

15 Network resource caching process 42 begins with a task 44, which establishes a high speed data communication link to computer network 10. It should be noted that the data communication link established in task 44 may, but need not be, data communication link 16 described above in connection with FIG. 1. Task 44 may, for example, activate a modem at client node 18 to create an on-line connection between 20 client node 18 and server node 12. Due to the high volume of data associated with many network resources 30, a high data rate communications channel (e.g., a T1 channel) is preferably utilized during process 42. Following task 44, a task 46 is performed to activate network browser program 26. Task 46 may be performed automatically upon a start-up procedure at client node 18, or the end-user may be 25 prompted to activate network browser program 26 via user interface 24 (see FIG. 1).

After activation of network browser program 26, a task 48 may be performed to condition the session and disk caches (not shown in FIG. 1) associated with network browser program 26 and/or client node 18. Those skilled in the art will recognize that a session cache may be utilized by network browser program 26 as a

"temporary" memory element. In the context of this description, network browser program 26 may obtain downloaded network files 28 and store such files in the session cache for subsequent processing and/or presentation at client node 18. Task 48 may be performed to ensure that sufficient memory space is available at client 5 node 18 to receive the desired amount of data associated with network resources 30. For example, task 48 may adjust the storage capacity of the session and disk caches or clear the contents of the session and disk caches.

After the session and disk caches are conditioned, client node 18 may begin to receive network resources 30 from server node 12. Accordingly, a task 50 is 10 performed to identify the next network resource 30 for which downloading is desired. Task 50 may require end-user interaction in response to a prompt provided by network browser program 26. In the preferred embodiment, each network resource 30 is identified by a unique address. For example, a Uniform Resource Locator (URL) is commonly used to identify Web pages and other on-line resources. A URL typically 15 identifies the resource provider, the server, the directory, and/or the specific file name associated with the particular on-line resource.

Assuming that the identified network resource 30 exists within computer network 10, a task 52 is performed to download network files 28 associated with the identified network resource 30 (see FIG. 1). Task 52 may cause network browser 20 program 26 to communicate with server node 12 in a suitable manner to initiate an appropriate data transmission procedure. As described above, the downloaded network files 28 may be temporarily stored within a session cache (not shown) associated with network browser program 26. In addition to task 52, a task 54 adds appropriate date/time stamps 40 (see FIG. 2) to the downloaded network files 28 25 using any number of conventional data processing methodologies. Task 54 may be performed at either server node 12 or client node 18. Although network files 28 may already have associated date/time stamps 32 (see FIG. 1), task 54 updates date/time stamps 32 or adds new date/time stamps 40 to indicate when network files 28 were downloaded.

Following task 54, a query task 56 is performed to determine whether more network resources 30 are to be downloaded to client node 18. Query task 56 may involve end-user interaction at client node 18, e.g., the manual entry or selection of additional URLs. The present invention is capable of downloading any number of Web 5 pages, electronic documents, or other on-line information during network resource caching process 42 (assuming the session and disk caches have sufficient capacity). If additional network resources 30 are selected for downloading and external caching, then process 42 is reentered at task 50. Thus, tasks 50, 52, 54, and 56 form a processing loop that identifies and downloads the desired number of network 10 resources 30.

If no additional network resources 30 need be downloaded, then query task 56 initiates a task 58. Task 58 is performed to transfer the downloaded network files 28 from the session cache to a subdirectory (not shown in FIG. 1) residing at client node 18. Task 58 may utilize conventional data processing techniques to copy or 15 move the relevant network files 28 to the subdirectory. This subdirectory may be a portion of conventional hard disk memory resident at client node 18. For purposes of this description, cached files 34 are those network files 28 that have been transferred to the subdirectory located at client node 18.

An optional task (not shown) may be performed prior to task 58 if necessary 20 for compatibility with network browser program 26 or specific processing protocols employed by computer network 10. The optional task may deactivate network browser program 26 or terminate data communication link 16 between client node 18 and server node 12 to facilitate the transferring of network files 28.

Following task 58, a task 60 is performed to create program segment 38 within 25 the subdirectory. Program segment 38 is described above in connection with FIG. 1. In addition to task 60, a task 62 is preferably initiated to create file directory 36 within the subdirectory. File directory 36 is described above in connection with FIG 2. Tasks 60 and 62 may require end-user participation at client node 18, e.g., programming, data input, or file management.

Following task 62, a task 64 causes the contents of the subdirectory to be transferred to external cache 20. After completion of task 62, the subdirectory contains cached files 34 associated with at least one network resource 30, file directory 36, and program segment 38. Task 64 may utilize any suitable 5 methodology to write the contents of the subdirectory onto a suitable storage medium, such as a CD-ROM, a magnetic recording disk, or an external hard drive. Following task 64, network resource caching process 42 ends. Although the contents of the subdirectory are preferably transferred according to task 64, such is not a requirement of the present invention. For example, cached files 34 residing in 10 the subdirectory may be indefinitely maintained for subsequent retrieval at client node 18 in a relatively short time (compared to the time required to download corresponding network files 28 from server node 12).

As described above, the preferred embodiment employs computer program product 21 (see FIG. 1) containing external cache 20. Accordingly, network 15 resources 30 may be read and processed by any compatible computer system, with or without active connection to computer network 10. This feature may be desirable to enable a provider of a particular network resource 30 to distribute cached files 34 to selected end-users while allowing widespread access to corresponding network files 28 via computer network 10.

FIG. 4 is a flow diagram of a network resource management process 66 performed by computer system 14. Process 66 is performed after external cache 20 has been created and configured for compatibility with client node 18. Process 66 may be implemented in software programs resident at client node 18 and process 66 may be performed in response to various end-user instructions received at client node 25 18.

Network resource management process 66 begins with a task 68, which establishes a network connection between client node 18 and server node 12. Task 68 may, for example, establish data communication link 16 (see FIG. 1) via a modem or other suitable data transmission device located at client node 18. Following task

68, a task 70 activates network browser program 26. Task 70 is similar to task 46 described above in connection with network resource caching process 42.

After network browser program 26 is activated, a task 72 activates external cache 20 such that cached files 34 associated with network resources 30 are 5 accessible to client node 18. Task 72 may, for example, prompt or activate program segment 38. Those skilled in the art will appreciate that task 72 may be performed automatically as an integral part of either task 70 or task 72. Alternatively, task 72 may require end-user interaction at client node 18. For example, in the preferred embodiment, client node 18 activates external cache 20 when the end-user inputs the 10 file name associated with program segment 38 in response to a LOCATION prompt produced by Netscape® Navigator®. Preferably, the manual activation of external cache 20 need only be performed during a setup procedure associated with network browser program 26 (rather than once per on-line session with computer network 10).

15 Following task 72, a task 74 receives a request for a specific network resource 30. As described above, a request for an Internet or WWW resource includes a unique address or URL. Typically, task 74 is responsive to an end-user input at client node 18. After task 74 receives a specific URL, a task 76 is performed. Task 76 20 instructs network browser program 26 to search external cache 20 for cached files 34 associated with the selected URL. Task 76 may be carried out by program segments within network browser program 26 or under the direction of program segment 38.

Following task 76, network resource management process 66 ends. It should be appreciated that process 66 may be carried out simultaneously with, or may be 25 integral to, any conventional process utilized to access, download, and manipulate on-line network resources. For example, nothing limits the present invention to accessing only cached files 34 in response to a request for network resources 30. Indeed, the present invention is flexibly configured to access a combination of network files 28 and cached files 34 related to a specific network resource 30.

FIG. 5 is a flow diagram of a network resource selection process 78 performed by computer system 14. Preferably, process 78 is performed at client node 18 in response to network resource management process 66. Generally, process 78 is performed to select whether files associated with the requested network resource 30 are downloaded from server node 12 or retrieved locally from external cache 20. Those skilled in the art should appreciate that several tasks described in connection with process 78 may be carried out, in full or in part, by network browser program 26. For simplicity, the following description assumes that only one file is associated with the requested network resource 30. However, as described above, any number of network files 28 or cached files 34 may actually define a given network resource 30. As such, process 78 may be repeated for each relevant file or modified to process a plurality of files simultaneously.

Network resource selection process 78 begins with a query task 80, which determines whether the network file 28 associated with the requested network resource 30 is available at server node 12 (see task 74 of network resource management process 66). Query task 80 may, for example, prompt an interrogation of a file directory maintained at server node 12. If query task 80 determines that the network file 28 is available at server node 12, then a query task 82 is initiated.

Query task 82 determines whether a corresponding cached file 34 associated with the requested network resource 30 is present in external cache 20. Query task 82 may cause network browser program 26 to access, survey, or search file directory 36 (see FIG. 2) for the cached file 34. If query task 82 determines that no corresponding cached file 34 exists, then a task 84 is performed to download the network file 28 from server node 12. Task 84 may utilize any number of conventional methodologies to download the network file 28. After task 84 downloads the network file 28 from server node 12, network resource management process 78 ends.

If, however, query task 82 determines that a corresponding cached file 34 is contained in external cache 20, then a query task 86 is initiated. Query task 86

determines whether the network file 28 (located during query task 80) is newer than the corresponding cached file 34. In the preferred embodiment, query task 86 compares the date/time stamp 32 (see FIG. 1) associated with the network file 28 to the date/time stamp 40 (see FIG. 2) associated with the corresponding cached file 34. Query task 86 may employ conventional data processing techniques known to those skilled in the art. Query task 86 ensures that the end-user is provided with the most current files associated with the requested network resource 30, whether such files are present at server node 12 or external cache 20.

If query task 86 determines that the network file 28 is newer than the corresponding cached file 34, then task 84 is initiated. As described above, task 84 causes the network file 28 to be downloaded from server node 12 to client node 18. If, however, query task 86 determines that the particular network file 28 is not newer than the corresponding cached file 34, then a task 88 is prompted. During task 88, the corresponding cached file 34 is retrieved from external cache 20 for processing by client node 18. In the preferred embodiment, if the network file 28 and the corresponding cached file 34 have equivalent date/time stamps, then task 88 is initiated. Thus, external cache 20 is accessed to quickly provide client node 18 with the file associated with the desired network resource 30. When network files 28 are updated at server node 12, computer network 10 processes the corresponding date/time stamps and accesses the updated network files 28 to thereby override external cache 20.

As described above, query task 80 determines whether the network file 28 associated with the selected network resource 30 is available at server node 12. If query task 80 determines that the network file 28 is not available at server node 12, then a query task 90 is initiated. Query task 90 determines whether a cached file 34 associated with network resource 30 is available at external cache 20. Query task 90 is substantially similar to query task 82 described above. Under certain circumstances, a corresponding network file 28 may not be available at server node 12. For example, a network file 28 may be unavailable if it is currently being

updated, if server node 12 or any other component of computer network 10 malfunctions, or if the requested network resource 30 no longer exists or is no longer accessible through server node 12. If query task 90 determines that a relevant cached file 34 is available at external cache 20, then a task 92 is performed. Task 5 92 retrieves the cached file 34 from external cache 20. Task 92 may be similar to task 88 described above. Following task 92, network resource management process 78 ends.

If, however, query task 90 determines that a cached file 34 corresponding to the requested network resource 30 is not present in external cache 20, then a task 10 94 may be performed. Task 94 provides an error message or other suitable indication to the end-user at client node 18. This message may indicate that the requested network resource 30 is currently unavailable, is being updated, or is not accessible via server node 12 or external cache 20. Task 94 may prompt the end-user to verify and reenter the requested URL, input a new URL, or contact a service technician. Of 15 course, network resource selection process 78 may prompt other processes or procedures related to computer network 10 in response to task 94. Following task 94, process 78 ends.

Those skilled in the art should appreciate that network resource selection process 78 may be repeated for any number of requests for any number of network 20 resources 30. Furthermore, computer system 14 may be configured to prompt the end-user to provide a particular computer program product 21 containing external cache 20, e.g., a specific CD-ROM, in response to a request for a specific network resource 30.

In summary, the present invention provides an improved external cache for use 25 with an on-line computer network. The external cache is configured for compatibility with conventional network browser programs. The external cache enables quick access to on-line resources, such as Web pages, directly from a client node rather than via a remote network server node. The present invention facilitates the combination of relatively "dynamic" Web page content, which may be susceptible to

periodic updating at the server node, with relatively "static" Web page content contained in the external cache. The external cache may be embodied in a portable storage medium such that Web pages or other network resources may be presented to an end-user without establishing a connection to the Internet or the World Wide

5 Web.

The present invention has been described with reference to a preferred embodiment. However, those skilled in the art will recognize that changes and modifications may be made to the preferred embodiment without departing from the scope of the present invention. For example, the processes described herein may be 10 included within a larger processing scheme and several individual process tasks may either be omitted or performed in a different order than that described herein. Furthermore, the specific hardware implementation described herein may be modified according to the requirements of each individual application. These and other changes and modifications are intended to be included within the scope of the present 15 invention, as expressed in the following claims.

CLAIMS

What is claimed is:

1. A method for transferring on-line resources from a server node to a client node within a computer network, said method comprising the steps of:
 - 5 establishing a data communication link between said client node and said server node;
 - downloading, from said server node to said client node, a network file associated with a network resource;
 - transferring said network file to a subdirectory residing at said client node to 10 thereby produce a corresponding cached file; and
 - creating, within said subdirectory, a computer readable program segment configured to cause a network browser program to access said cached file in response to a request for said network resource, said request originating from said client node.
- 15 2. A method according to claim 1, wherein said program segment is compatible with hypertext markup language (HTML).
3. A method according to claim 1, further comprising the step of associating a first date/time stamp with said cached file, wherein:
 - 20 said network file has a second date/time stamp associated therewith;
 - said network browser program is configured to access said cached file when said first date/time stamp is newer than said second date/time stamp; and
 - said network browser program is configured to access said network file when said second date/time stamp is newer than said first date/time stamp.
4. A method according to claim 1, wherein said downloading step 25 comprises downloading said network file to a session cache residing at said client node, said session cache being formatted for compatibility with said network browser program.

5. A method according to claim 1, further comprising the step of identifying said network resource with a unique address, said identifying step being performed prior to said downloading step.

6. A method according to claim 1, further comprising the step of
5 transferring said cached file and said program segment from said subdirectory to a storage medium compatible with said client node.

7. A method according to claim 1, further comprising the step of creating, within said subdirectory, means for directing said network browser program to select said cached file from a plurality of cached files associated with said network resource,
10 wherein said means for directing is responsive to said request.

8. A method according to claim 1, wherein said cached file and said network file are designated with the same file name.

9. A network resource management and allocation method for use in a computer network comprising a client node having an external cache containing a
15 cached file associated with a first version of a network resource, a server node configured to provide access to a network file associated with a second version of said network resource, and a data communication link between said server node and said client node, said method comprising the steps of:

receiving, at said client node, a request for said network resource;
20 comparing a first date/time stamp associated with said cached file to a second date/time stamp associated with said network file;
retrieving said cached file from said external cache when said first date/time stamp is newer than said second date/time stamp; and
downloading, via said data communication link, said network file from said
25 server node to said client node when said second date/time stamp is newer than said first date/time stamp.

10. A method according to claim 9, wherein a network browser program resides at said client node and said method further comprises the step of instructing

said network browser program to search said external cache for said cached file in response to said request.

11. A method according to claim 10, further comprising the step of prompting a computer readable program segment, said program segment residing at 5 said client node and being configured to initiate said instructing step.

12. A method according to claim 10, further comprising the step of prompting a computer readable program segment, said program segment residing at said client node and being configured to indicate a location of said external cache to said network browser program.

10 13. A method according to claim 9, wherein said request includes a uniform resource locator (URL).

14. A method according to claim 9, wherein said cached file and said network file are designated with the same file name.

15. A method according to claim 9, further comprising the step of retrieving said cached file from said external cache when said first date/time stamp is equivalent to said second date/time stamp.

16. A computer program product compatible with a client node operating within a computer network, said computer program product comprising:

20 a storage medium having computer readable program code and computer readable data embodied therein;

 said computer readable data comprising a cached file associated with a first version of a network resource, wherein a network file associated with a second version of said network resource resides at a server node within said computer network; and

25 said computer readable program code comprising a program segment configured to cause a network browser program to access said cached file in response to a request for said network resource, said request originating from said client node.

17. A computer program product according to claim 16, wherein said segment is compatible with hypertext markup language (HTML).

18. A computer program product according to claim 16, wherein:
said cached and network files have first and second date/time stamps,
5 respectively, associated therewith;
said network browser program is configured to access said cached file when
said first date/time stamp is newer than said second date/time stamp; and
said network browser program is configured to access said network file when
said second date/time stamp is newer than said first date/time stamp.

10 19. A computer program product according to claim 16, wherein said storage medium comprises a digital recording disc.

20. A computer program product according to claim 16, wherein said storage medium comprises a magnetic recording disc.

21. A computer program product according to claim 16, wherein:
15 said computer readable data comprises a plurality of cached files associated
with said first version of said network resource; and
said computer program product further comprises means for directing said
network browser program to select said cached file from said plurality of cached files
in response to said request, said means for directing being embodied within said
20 storage medium.

22. A computer system for managing and allocating network resources, said computer system comprising:

a client node configured to communicate with a server node of a computer network;

25 a network browser program residing at said client node;
an external cache in data communication with said client node, said external cache containing a cached file associated with a first version of a network resource;
and

a computer readable program segment residing at said client node, said program segment being configured to indicate a location of said external cache to said network browser program.

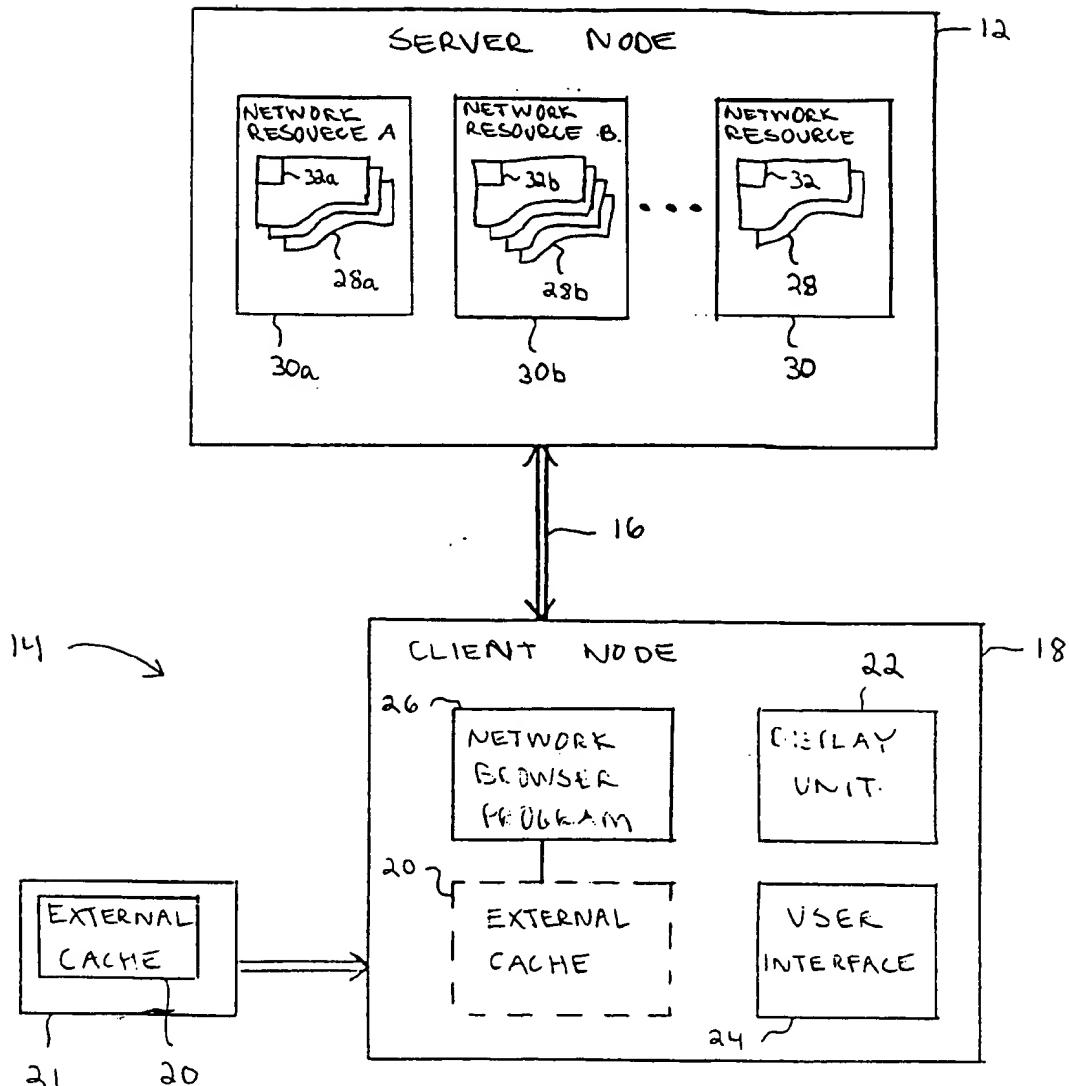
23. A computer system in accordance with claim 22, wherein said program segment is further configured to cause said network browser program to access said cached file in response to a request for said network resource.

24. A computer system in accordance with claim 23, wherein:
said server node is configured to provide access to a network file associated with a second version of said network resource; and
10 said network browser program is configured to access said cached file when said network file is inaccessible from said server node.

25. A computer system in accordance with claim 23, wherein:
said server node is configured to provide access to a network file associated with a second version of said network resource;
15 said cached and network files have first and second date/time stamps, respectively, associated therewith;
said network browser program is configured to access said cached file when said first date/time stamp is newer than said second date/time stamp; and
said network browser program is configured to access said network file when
20 said second date/time stamp is newer than said first date/time stamp.

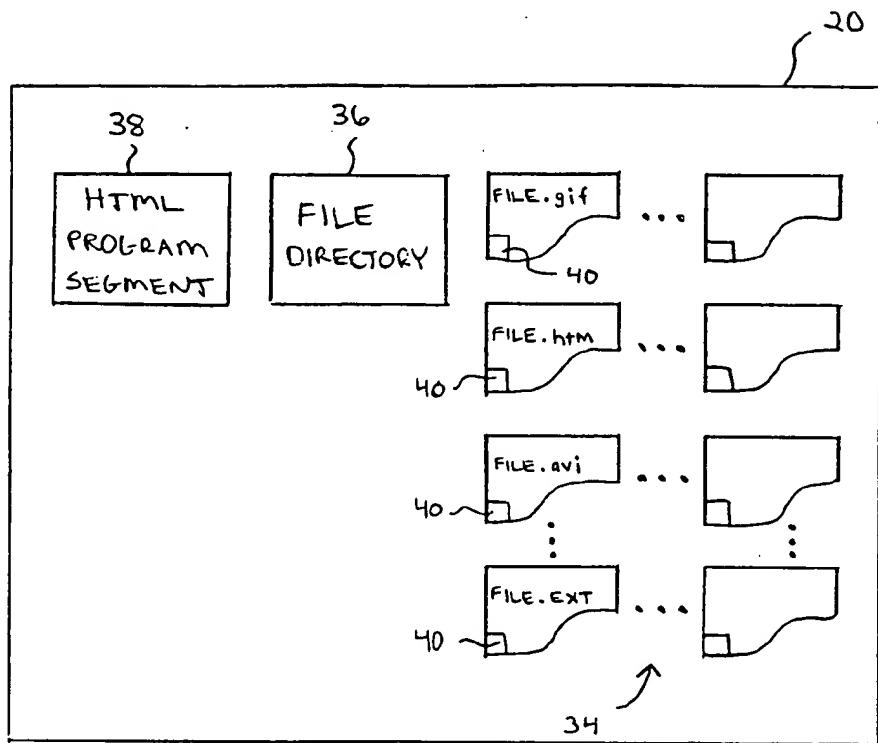
26. A computer system in accordance with claim 22, wherein said external cache and said program segment are embodied in a single storage medium.

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FIG. 110

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FIG. 2.



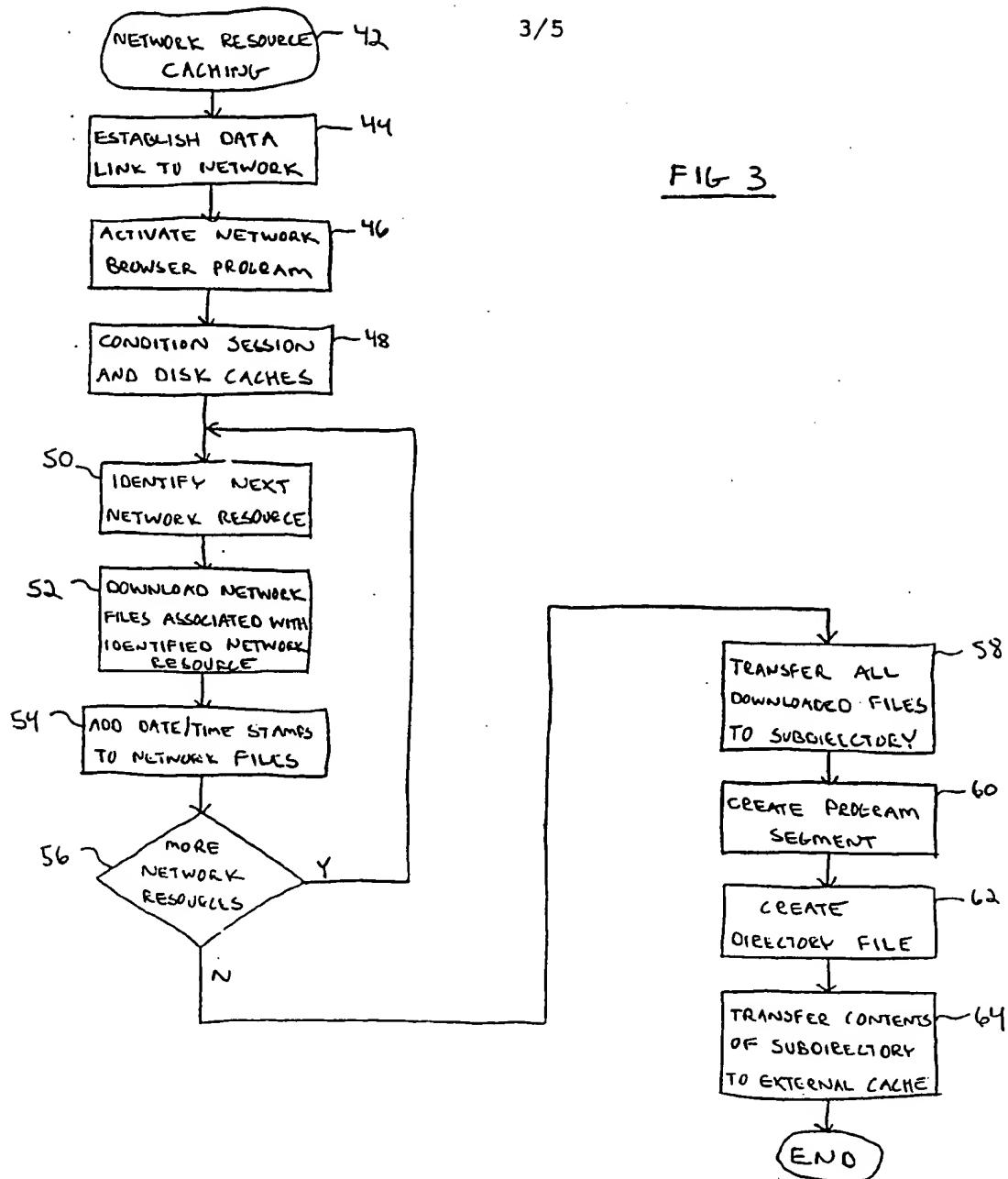
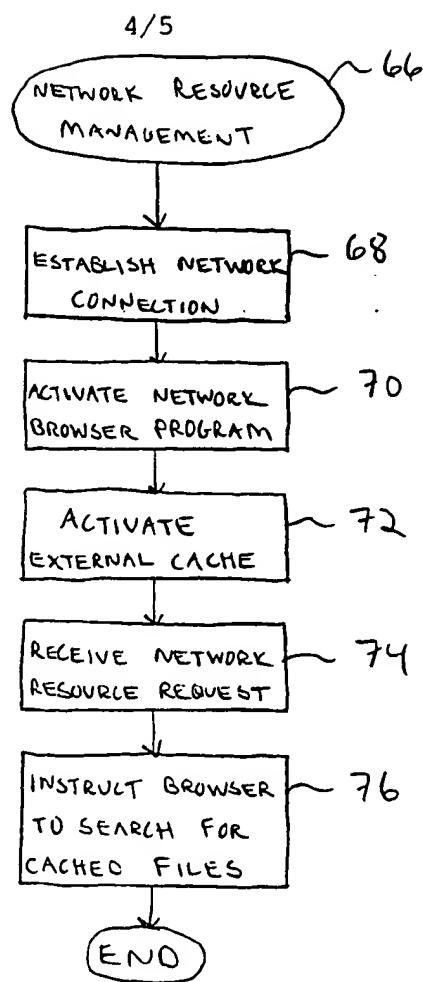
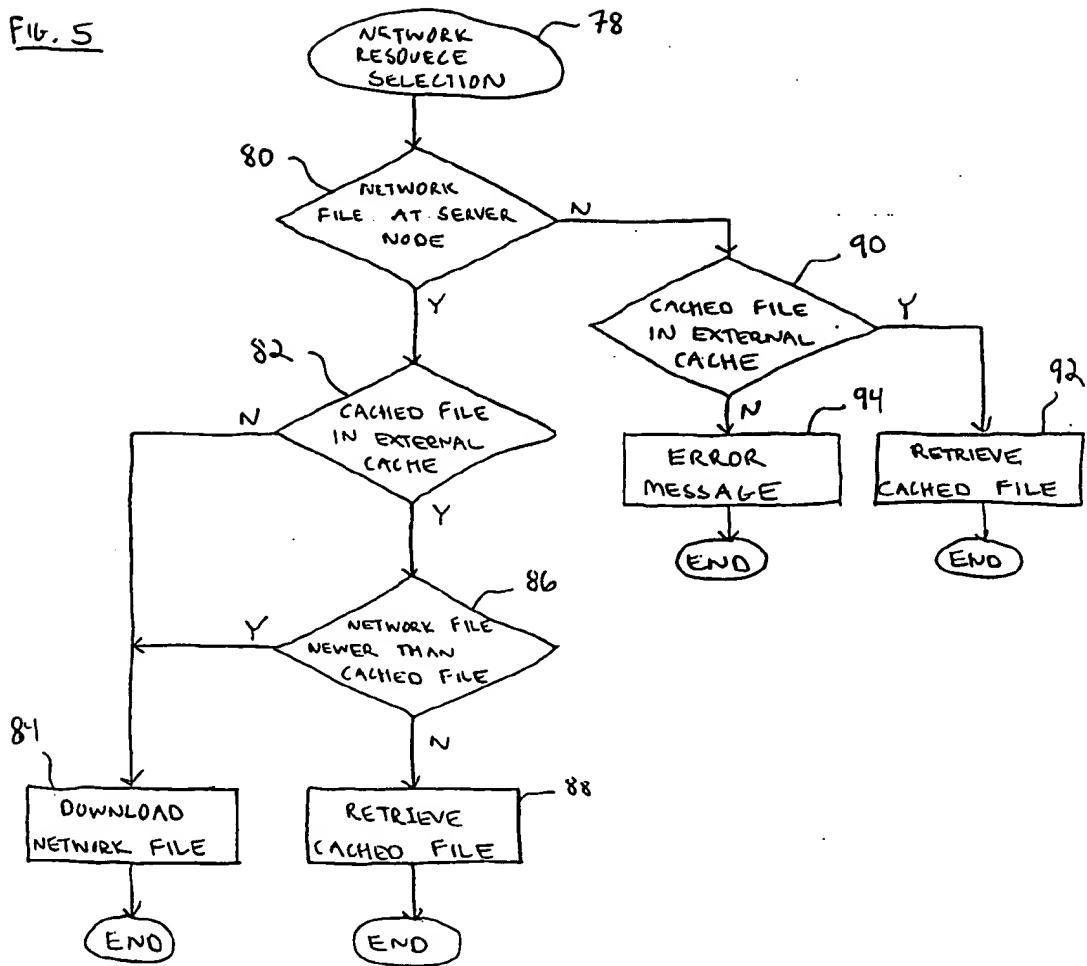


FIG. 4

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FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/19956

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 15/16

US CL :707/10, 201; 395/651, 200.33

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 707/10, 201; 395/651, 200.33

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

none

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

STN APS, IEEE publications

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,887,204 A (JOHNSON et al) 12 December 1989, abstract.	1-26
Y,P	US 5,572,643 A (JUDSON) 05 November 1996, abstract.	1-26
Y,P	US 5,644,751 A (BURNETT) 01 July 1997, col. 1.	1-26
Y,P	US 5,706,435 A (BARBARA et al) 06 January 1998, abstract.	1-26

 Further documents are listed in the continuation of Box C. See patent family annex.

• Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
B earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"A"	document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means		
P document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
27 JANUARY 1998	13 APR 1998
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer, ALYSSA BOWLER
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